

Hawaii Space Grant Consortium
University of Hawai`i at Mānoa
Dr. Luke Flynn
808-956-3138
<http://www.spacegrant.hawaii.edu>
Grant Number: NNX10AI93H

PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The Hawai`i Space Grant Consortium is a Designated Consortium funded at a level of \$575,000 for fiscal year 2013.

PROGRAM GOALS

The Hawai`i Space Grant Consortium (HSGC) inspires, nurtures, and trains space scientists, space settlers, and aerospace engineers of the future. HSGC's strategy and programs are dynamic and reviewed annually to reflect State as well as NASA program needs and include development and maintenance of the HiSTEM Pipelines of activities (undergraduate/graduate opportunities supported by pre-college activities in the areas of space science, engineering, and remote sensing), enhancing undergraduate education through research (fellowships, traineeships, and internships that **must** have a NASA focus) and course curricula, improving research infrastructure (Hawai`i Space Flight Laboratory (HSFL)), training pre-service and in-service teachers (Future Flight Hawai`i and Families Exploring Science Together (FESTival) Nights Programs), and educating the public about new NASA discoveries (Windward Community College Aerospace Lab, Planetary Science Research Discoveries and Astronaut Days of Discovery events), helping to strengthen the State economy (HSFL, extensive support and continued efforts of Hawai`i's initiatives to promote global awareness and collaboration in robotics).

PROGRAM/PROJECT BENEFIT TO OUTCOME (1, 2, & 3)

Chester Lim – Outcome 1: Chester Lim was a Jet Propulsion Laboratory summer intern who worked on the ISAAC (Instrument Shared Artifact for Computing) Project. ISAAC was a three-year JPL research and development task. Its main purpose is to provide mission designers a workflow that takes high level block diagrams and implements them into hardware, thus hoping to cut the design time and cost by introducing a reusable

FPGA data platform that has prebuilt cores that the designers can use. Chester was very successful with his internship and is now a full time employee of the Jet Propulsion Laboratory.

Taylor Alfiler – Outcome 2: Hi-tech jobs are scarce on Kauaʻi. In summer 2012, Taylor Alfiler received an HSGC internship to work with General Dynamics Advanced Information Systems on his home island of Kauaʻi. Taylor worked on advanced software to split large radar data sets into packets that could then be reassembled at different machines. His algorithm was successfully implemented and was adopted by the General Dynamics Software Development Kit (SDK). Taylor continued his association with General Dynamics and upon graduation in 2013, General Dynamics offered and Taylor accepted a Junior Systems Engineer position with the company. Taylor is an excellent example of how the HiSTEM pipeline works to propel students, in this case interns working on specific technical problems for Hawaiʻi hi-tech industries, to STEM careers.

ʻImiloa Astronomy Center – Outcome 3: With support from the Hawaiʻi Space Grant Consortium, the Carl Sagan Planet Walk in Ithaca, NY (and partially funded by New York Space Grant Consortium) was expanded to become the largest exhibit in the world. HSGC helped to fund the design and construction of a sculpture that marks Alpha Centuri, our solar system's closest star, at the ʻImiloa Astronomy Center in Hilo, HI. The exhibit begins in downtown Ithaca, NY and concludes 8000 km away at the Kamailehope (Hawaiian for Alpha Centuri) monument. Visitors to Ithaca, NY receive a small blue "Passport to the Solar System" booklet that now includes a place for a stamp from the Kamailehope sculpture in Hilo.

PROGRAM ACCOMPLISHMENTS

Outcome 1: *Hawaiʻi Space Flight Lab (HSFL)* – The HSFL is an HSGC Research Infrastructure program that is leveraging State, Federal (including NASA), and corporate partners to provide student and workforce training opportunities to design, build, launch, and operate small spacecraft. The State of Hawaiʻi signed a Space Act Agreement NASA Ames, that was renewed in 2013, to help with HawaiiSat-1. HawaiiSat-1 has been redesigned to HiakaSat, which is a 55-kg microsatellite that has an infrared hyperspectral imager developed by University of Hawaiʻi faculty and will be launched to a 430-km orbit from Hawaiʻi in Fall 2014 on the Operationally Responsive Space-4 Mission. HiakaSat will also carry a technology payload developed by Honolulu Community College. HSFL is also working on two low-cost lunar mission concepts with NASA Ames and international partners. *Kauaʻi Community College Trainees* – Kauaʻi CC trainees and fellows are receiving training to communicate with satellites and will have UHF/VHF command and control of HiakaSat as well as an S-band data downlink on campus. *Kapiʻolani Community College:* HSGC is very proud to announce that KCC students placed 1st in the International CanSat Competition sponsored by the American Astronautical Society (AAS) and the American Institute of Aeronautics and Astronautics (AIAA). The KCC team made up of 100% unrepresented students. The competition involves teams of undergraduate and/or graduate students in simulations of the delivery of a sensor payload to a planet's surface. Through this effort that incorporates all aspects of engineering from the design, testing, integration, and finally launch of their system on

a rocket to an altitude of ~ 1000 meters, students develop all the skills to becoming experienced engineers.

Outcome 2: *Education Specialists are honored with the Living Treasures Award* – HSGC has been honored to work with two outstanding educators – Art and Rene Kimura – who single-handedly are responsible for developing and managing the success of our K-12 programs. Art and Rene Kimura were honored this year by the State of Hawai'i with the prestigious Living Treasures Award that has been reserved for outstanding individuals who exemplify the Aloha spirit. The award notes that Art and Rene Kimura are a dynamic Duo as teachers and explorers. They illustrate a sense of leadership and innovation towards the study and exploration of the world around them. Mr. and Mrs. Kimura motivate their students by challenging them to achieve excellence through observation and experimentation.

Outcome 3: Windward CC is constantly expanding the offerings of its Aerospace Lab that includes flight simulators, a planetarium, radio telescopes, and soon, the HSFL education and public outreach center to track HSFL missions. Windward CC's Dr. Jake Hudson is also helping with the Kaua'i CC rocketry program. *Astronaut Days of Discovery* – These days celebrate Hawai'i's astronauts and remain overwhelmingly popular. They showcase NASA and STEM presentations and hands-on activities. HSGC coordinates the events but Hawaiian Electric Company, the Chatlos Foundation and American Savings Bank are major sponsors that help to donate funds and volunteer to make the events successful. *`Imiloa Astronomy Center* – The `Imiloa Astronomy Center now features a part of the Carl Sagan Planetary Walk that begins in Ithaca, NY. The `Imiloa Astronomy Center sculpture, Kamailehope, represents the position of the closest star to our solar system, Alpha Centuri, on the scale of the Sagan Planetary Walk.

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES

- **Student Data and Longitudinal Tracking:** Total Fellowship/Scholarship awards in FY2013 = 83; 40 of the total awards represents underrepresented minority F/S funding including 20 awards to women. Please note that this information is incomplete due to our grant period ending on April 2013; therefore, the number to participants in the program this FY2013 year will increase significantly from FY2012 data. We are still currently working on finalizing our numbers to report on student tracking. This information will be available for our OEPM data report. Improvements include the increase in number of students funded in our program and of maintaining our percentage of underrepresented students reached.
- **Minority-Serving Institution Collaborations:** UH Hilo, UH Maui College as well as all of the UH System Community Colleges are minority serving institutions. The HSGC maintains strong ties with its affiliates through dedicated associate directors. Windward, Honolulu, Kapi`olani, Kaua`i, and UH Maui College receive HSGC support for CanSat programs. Windward CC is also supported for the Aerospace

Lab. Kaua'i CC has installed UHF/VHF and S-band ground stations for the HSFL and new research experiments. Honolulu CC has a new X-band receiving station that can be used for HSFL missions. Five UH minority serving colleges (Windward, Honolulu, Kapi'olani, Kaua'i, Leeward, and UH Maui College) want to build CubeSats and will take part in a NASA CubeSat Launch Initiative project that has already been selected for flight.

- **NASA Education Priorities:** The HSGC has partnered with the State of Hawai'i and others to host hands-on robotics programs (FIRST, Botball, MicroRobots) at the elementary and intermediate school levels. HSGC has a rich history of teacher training using hands-on NASA-related science content through Families Experiencing Science Together (FESTival Nights) that include a minimum of 8 science teachers and 100 student-parent teams in an evening hands-on workshop, Future Flight Hawai'i summer program that is a weekend long activity using related hands-on activities to replicate science missions to other planets, and the two Astronaut Days of Discovery where teachers help to run up to 20 hands-on activities for 600 students and parents during a day-long science fest. Five UH minority serving colleges (Windward, Honolulu, Kapi'olani, Kaua'i, Leeward, and UH Maui College) want to build CubeSats to encourage underrepresented students to pursue STEM careers. Honolulu and Kaua'i CC are working to convert their physical electronics labs to be able to build satellite circuit boards. This training is important for future development of a small sat industry in Hawai'i. HSGC encourages the career development of young faculty by providing mini-grants and travel awards as appropriate in order to further NASA research interests. HSFL is working with NASA Ames to develop small (~100 kg) lunar mission concepts for less than \$50M each using the rocket that will be used in the ORS-4 Mission.

IMPROVEMENTS MADE IN THE PAST YEAR

Within the \$575,000 budget, HSGC has tried to maintain as many programs as possible. We have re-focused our efforts on the fellowship program and deleted visits to NASA Centers as we can reach more students in Hawai'i with fellowships, traineeships and local internship opportunities.

HSFL –The ORS-4 launch will take place in Fall 2014. HSFL supports many of NASA's OCT goals including the development of a small spacecraft (HiakaSat), small launch vehicle (Super-Strypi, Sandia National Lab), and mission operations architecture for controlling small spacecraft (COSMOS). HiakaSat is being built by students that are partially supported on NASA fellowships and internships. Honolulu CC provided a technology payload for HiakaSat that will take pictures of the release of the HiakaSat satellite from the launch vehicle during the ORS-4 Mission. Installation of an S-band ground station at Kaua'i CC has continued and will be completed in Spring 2014.

Percentage of Underrepresented Students Served – HSGC maintains support for underrepresented students who received 48% of the 2013 awards, 51% of 2012 awards, and 52% of 2011 awards.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

UNIVERSITY OF HAWAII AT MANOA – 4-year university with graduate programs – Director Dr. Luke Flynn; Program Coordinator Ms. Marcia Rei Sistoso; Headquarters of HSGC and HSFL; majority of graduate and undergraduate fellows, interns, and trainees perform research in CubeSat and small satellite design, astronomy, planetary science, geology, engineering, marine science, remote sensing, and computer science.

UNIVERSITY OF HAWAII AT HILO – 4-year university with graduate programs – Associate Director Dr. Ken Hon; undergraduate fellows and trainees have focused research on the strong astronomy, geology, and remote sensing programs. UH-Hilo along with American Savings Bank hosts the Astronaut Ellison Onizuka Day public science program annually in January.

UNIVERSITY OF HAWAII MAUI COLLEGE – 4-year university with graduate programs – Associate Director Dr. John Pye [Replaced by: Dr. Jung Park in January 2014]; undergraduate fellows and trainees have focused research in astronomy, optics, and STEM. The Akamai Internship Program gives students opportunities for internships through the Center for Adaptive Optics.

HAWAII COMMUNITY COLLEGE – Associate degree granting community college – Associate Director Dr. Joseph Wilcox; undergraduate trainees focus on STEM and astronomy.

HONOLULU COMMUNITY COLLEGE – Associate degree granting community college – Associate Director Dr. Gregory Witteman; undergraduate fellows and trainees have focused research on CanSat design. Dr. Witteman and students built a technology payload for the HiakaSat spacecraft. Honolulu CC assists with Astronaut Lacy Veach Day which is a festival of science activities held on O`ahu in October.

KAPOLANI COMMUNITY COLLEGE – Associate degree granting community college – Associate Director Dr. John Rand [Interim: Dr. Herve Collin]; undergraduate fellows and trainees have focused research on CanSat design and competitions, and engineering. Kapi`olani CC receives Federal funding to attract underrepresented students to STEM careers and HSGC programs.

KAUA`I COMMUNITY COLLEGE – Associate degree granting community college – Associate Director – To be determined [Pending appointee: Dr. Georgeanne Friend as Associate Director of Kaua`i CC]; undergraduate fellows, interns, and trainees have focused research on STEM including satellite telemetry with a new ground station, rocketry, CanSat, meteorology, and optics.

LEEWARD COMMUNITY COLLEGE – Associate degree granting community college – Associate Director Mr. Roger Kwok [Replaced in 2013 by: Dr. Nikolaj Nordkvist]; undergraduate fellows and trainees have focused research on astronomy. Leeward CC assists with the HSGC summer Future Flight Hawai`i program and Astronaut Lacy Veach Day which is a festival of science activities held on O`ahu in October.

WINDWARD COMMUNITY COLLEGE – Associate degree granting community college – Associate Director Dr. Joseph Ciotti; Rocketry Coordinator/CanSat Liaison Mr. Jacob Hudson; undergraduate fellows and trainees have focused research in astronomy, CanSat design and competition, and rocketry. Windward CC hosts various outreach activities from the Hokulani Imaginarium and through the Aerospace Lab, serves as outreach for HSFL, and offers an aerospace certificate.

UNIVERSITY OF GUAM – 4-year university with graduate programs – Associate Director Dr. Mark Lander, undergraduate focus on STEM.

HAWAIIAN ELECTRIC COMPANY – Industrial affiliate – Industry Affiliate Mr. Paul Fetherland and Mrs. Dora Nakafuji; HECO supports Astronaut Lacy Veatch Day and other HSGC programs both with funding and volunteers.

STRATEGIC THEORIES UNLIMITED, LLC – Industrial affiliate – Liaison/Industry Affiliate Mr. Stewart Burley, STU LLC; assists recruitment from Kauaʻi CC to participate in HSGC’s undergraduate programs and local internship opportunities on Kauaʻi, and provides consulting expertise, networking opportunities with other industry partners and support on HSFL efforts with the Pacific Missile Range Facility, Lihue, Kauaʻi.

The National Space Grant Office requires two annual reports, the Annual Performance Data Report (APD) and the Office of Education Performance Measurement System (OEPM) report. The former is primarily narrative and the latter data intensive. Because the reporting timeline cycles are different, data in the two reports may not necessarily agree at the time of report submission. OEPM data are used for official reporting.